No. 870,138. PATENTED NOV. 5, 1907.

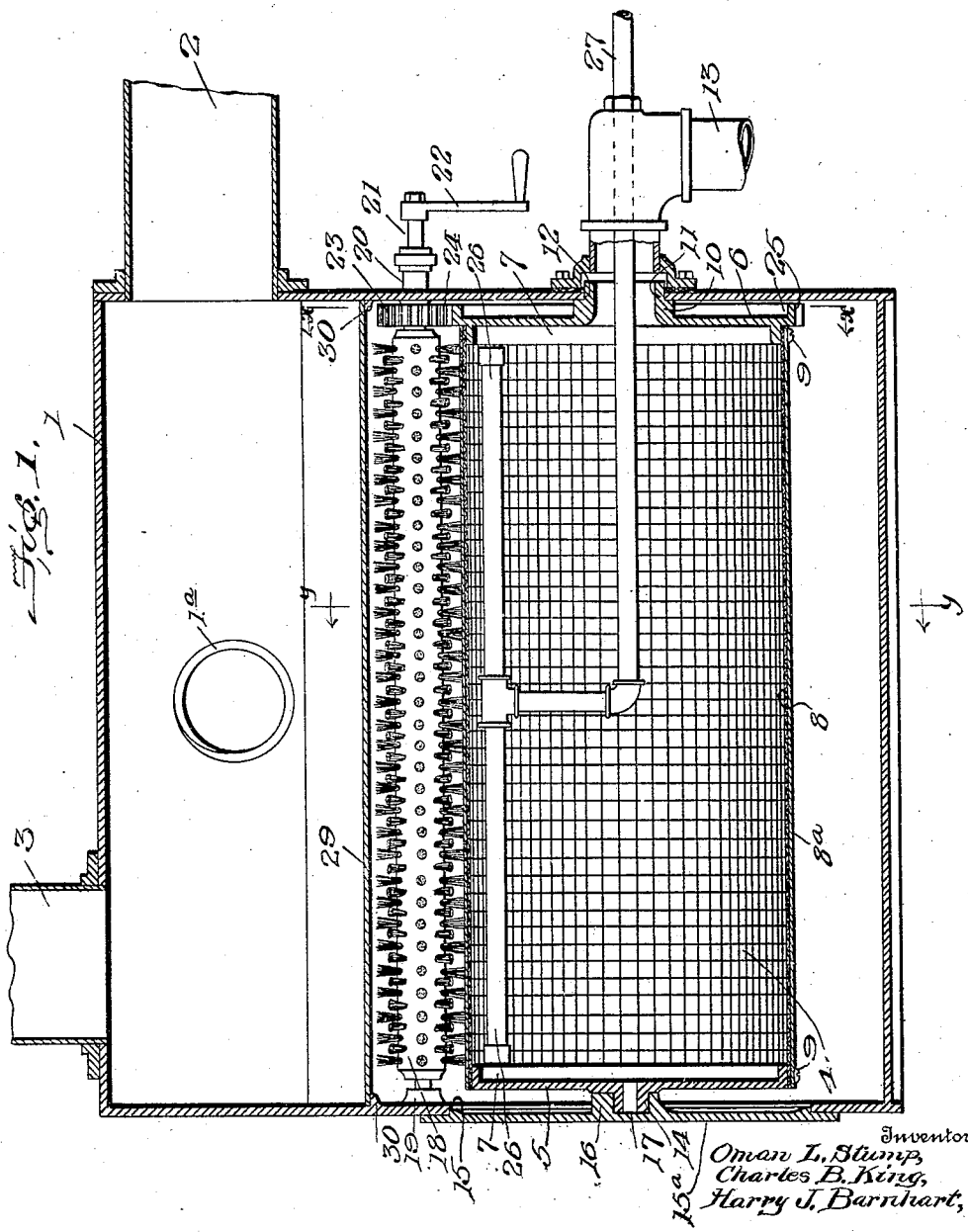
O. L. STUMP, C. B. KING & H. J. BARNHART.

FEED WATER FILTER.

APPLICATION FILED FEB. 23, 1907.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2

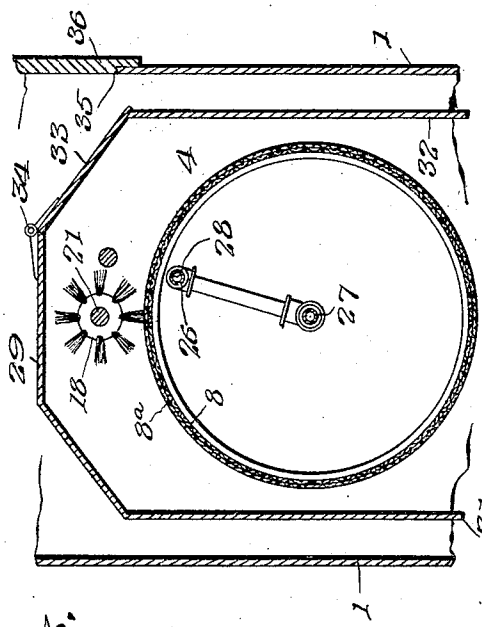

Fig. 3.

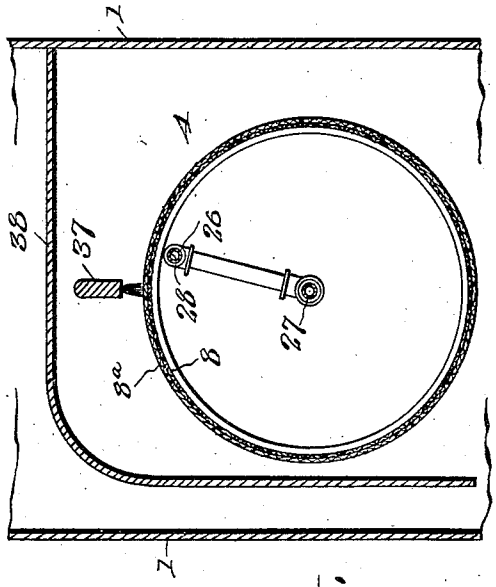

Fig. 4.

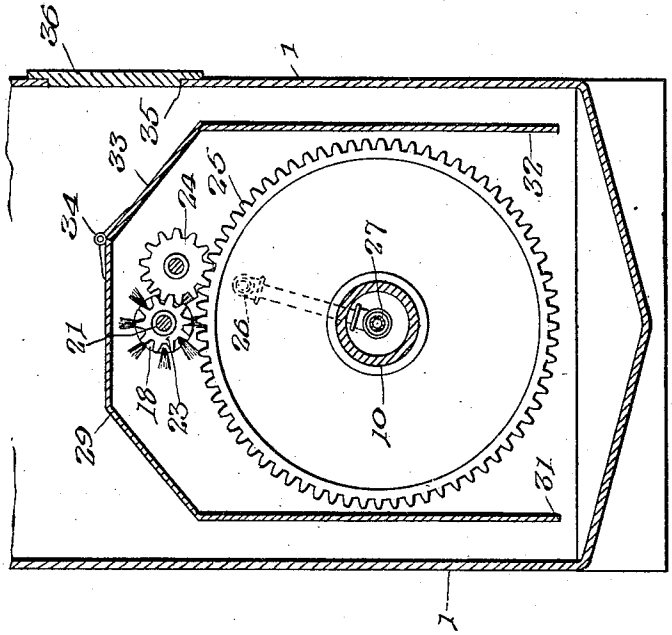

Fig. 2.

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FEED-WATER FILTER.

No. 870,138. Specification of Letters Patent. Patented Nov. 5, 1907.

Application filed February 23, 1907. Serial No. 358,794.

To all whom it may concern:

Be it known that we, OMAN L. STUMP, CHARLES B. KING, and HARRY J. BARNHART, citizens of the United States, residing at Marion, in the county of Marion and State of Ohio, have invented certain new and useful Improvements in Feed-Water Filters, of which the following is a specification, reference being had therein to the accompanying drawings.

The present invention relates to feed water filters for steam boilers. Filters of this character are designed to be placed within the feed water heater for the purpose of separating from the feed water the impurities precipitated by the chemical action of reagents and by the action of the exhaust steam upon the water.

The object of the present invention is to provide a filter of this character with the largest possible area of filtering surface, thus increasing the period of service of the filter; to provide means for cleaning the filter without removing the same and while the heater is in operation; to provide such a filter, the filtering surface of which can be readily removed and renewed; and further to provide means for depositing a part of the impurities before the water comes into contact with the filter, thus diminishing the amount of sediment deposited upon the filter surface and increasing its period of usefulness proportionately.

With these objects in view our invention consists of certain novel features of construction to be hereinafter described, and then more fully pointed out in the claims.

In the accompanying drawings, Figure 1 is a longitudinal sectional view taken vertically through the center of a feed water heater equipped with the improved filter; Fig. 2 is a transverse sectional view of the filter, taken on the line x x of Fig. 1; Fig. 3 is a transverse sectional view, taken on the line y y of Fig. 1; and Fig. 4 is a similar view showing a slightly modified form of the same.

In these drawings we have illustrated one embodiment of our invention, in which the reference numeral 1 indicates the feed water heater which may be of any suitable character and is provided with the feed water inlet 1^a, the exhaust inlet 2, and the steam outlet 3. Preferably mounted within the feed water heater 1, but capable of being otherwise arranged, is the filter 4, which may be of any suitable shape, that preferred being the cylindrical form here shown. The filter is preferably horizontally and rotatably mounted in the heater and consists, in the form here shown, of circular heads 5 and 6 provided with inwardly extending flanges 7, to which are secured the opposite ends of a wire fabric or other foraminous material 8, preferably of a non-corrodible nature, which extends about the peripheries of the heads and forms the cylindrical body of the filter, upon which the filtering fabric 8^a is supported. The filtering fabric may be of any suitable material, such, for instance, as muslin or a fine wire mesh, either of which give very satisfactory results. This fabric completely covers the cylindrical body 8 and is preferably removably secured to the flanges 7 in any suitable manner, that herein shown consisting of screw bolts 9 extending through the fabric at intervals and engaging apertures in the flanges 7, thus enabling the fabric to be easily removed and renewed. The head 6 is provided with an outwardly extending boss 10 having a reduced outer portion 11 adapted to form a trunnion and engage the bearing aperture 12 in the adjacent ends of the heater. This boss or trunnion is hollow and forms a passage connecting the interior of the filter with the feed water pipe 13. The opposite head 5 of the filter is provided with a suitable boss or trunnion 14, adapted to engage a suitable bearing in the corresponding wall of the heater. This wall of the heater is preferably provided with an opening 15 of sufficient size to permit the filter to be removed bodily therefrom and is closed by a suitable door or plate 15^a which is provided on its inner surface with a boss 16 having bearing apertures adapted to receive the trunnion 14 in the adjacent end of the filter.

Mounted within the heater and extending longitudinally thereof is a brush 18 which is so positioned relatively to the filter that its bristles come in contact with the surface thereof. This brush is preferably of a rotatory character and is journaled at its opposite ends in bearings 19 and 20 on the walls of the heater. The shaft 21 of the brush extends beyond the bearing 20 at one end of the brush and is provided with a suitable crank 22 for rotating the same. A pinion 23 is mounted on the shaft 21 between the bearing 20 and the corresponding end of the brush and meshes with a pinion 24, which, in turn, meshes with a gear 25 carried by the filter 4, and preferably formed integral therewith by providing teeth in the periphery of the head 6. Thus, it will be seen that by rotating the shaft 21 through the medium of the crank 22, the brush and the filter will be rotated in the same direction, thereby causing their adjacent surfaces to move in opposite directions. A spray pipe 26 is mounted within the filter and preferably extends longitudinally thereof. This spray pipe is connected by a pipe 27 with a suitable source of water supply and is preferably connected with the feed water pipe between the feed water pump and the boiler, thereby securing a supply of hot, purified water under a high pressure. The spray pipe 26 is preferably so located that the discharge from the apertures 28 thereof will be directed against the inner surface of the filtering fabric slightly beyond the point of contact of the same with the brush 18.

A hood 29 is preferably provided and extends the full length of the heater above the brush and filter and

is supported within the heater and in contact with the ends thereof in any suitable manner, that herein shown consisting of the lugs or brackets 30. This hood extends across the top of the filter 4 and down on either side thereof, as shown at 31 and 32, to a point near the bottom of the heater. This hood is provided near the upper portion thereof with a longitudinally extending door 33, which is hinged at 34 to the upper part of the hood 29 and is of a size sufficient to allow ready access to the filter for the purpose of renewing the filtering fabric, or for any other purpose. The heater is provided in its wall adjacent to the door 33 with a manhole 35, which extends substantially the full length of the filter 4 and corresponds in size to the door 33 and is provided with a suitable closure 36.

The operation of the device will be readily understood from the foregoing description. In brief, it is as follows: the feed water enters the feed water heater 1 and is there acted upon by the chemical reagents and by the exhaust steam which is admitted to the heater. The hood 29 prevents the incoming water and the steam from coming into contact with the filtering fabric and with the brushes, thereby protecting the same against injury from that source. The hood causes the water to flow downward about the sides thereof and to rise gently about the filter, thereby depositing the heavier precipitates at the bottom of the feed water heater where they can be easily removed through the blow-off, and the water which comes in contact with the filtering fabric 8 of the filter contains but a portion of the original impurities. The water then passes through the filtering fabric 8 and the impurities remaining therein are deposited upon the outer surface of the said fabric, the water being drawn from the interior of the filter through the hollow trunnion 10 and feed water pipe 13. When the sediment has accumulated on the surface of the filtering fabric in such quantities as to interfere with the operation of the same, the level of the water in the heater is lowered to a point below the spray pipe, but above the outlet, so that the operation of the heater is not interrupted, and the crank 22 is operated to cause the adjacent surfaces of the brush 18 and the filter 4 to move in opposite directions, thus bringing the brush into contact with all parts of the filtering surface. Water is also admitted to the spray pipe 26 and discharged against the inner surface of the filtering fabric 8 at a point just beyond the point of contact with the brush 18. This water passes through the filtering surface and serves to dislodge the impurities from the outer surface thereof and to free said surface of all sediment. The water used for this purpose, coming from the feed pipe at a point between the feed water pump and the boiler, is under high pressure and is hot and pure, thereby accomplishing its purpose without cooling the water within the heater and without adding impurities to the water within the filter. When the filtering fabric 8 becomes so worn or is damaged to such an extent as to impair its usefulness, the screw bolts 9 are removed and the fabric removed from the heads 5 and 6 and the new fabric placed about the same and the bolts reinserted in the heads.

We have here shown the brush as a rotary brush, but it is obvious that a stationary brush may be employed, such as is shown at 37 in Fig. 4, and the filter 4 revolved to bring the surface thereof into contact with this brush; and further that the hood 29 need not extend on both sides of the filter, as shown in the preferred form, but may be secured at one side to the side wall of the heater, having its other side extending down beyond that side of the filter furthest from the wall of the heater to which the hood is secured, as shown at 38 in Fig. 4, thus inclosing the filter between the walls of the hood and the wall of the heater and allowing the water to pass down upon but one side of the same.

We wish it to be understood that we do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent, is:—

1. In a device of the character described, the combination, with a feed water heater having a bearing lug on one wall thereof, and an aperture in the opposite wall thereof, of a rotary filter having trunnions, one of which is adapted to engage said bearing lug and the other to engage said aperture, said other trunnion having a passageway therein connecting the interior of said filter with the feed water pipe, and a filtering fabric extending about the outer surface of said hollow filter, and means for detachably securing the same to said filter.

2. In a device of the character described, the combination, with a feed water heater having an aperture in one wall thereof, a closure for said aperture having a bearing thereon, and a bearing on the opposite wall of said heater, of a hollow filter of less diameter than the aperture in the wall of said heater and having trunnions adapted to engage said bearings, and an outlet connected with the interior of said hollow filter, substantially as described.

3. In a device of the character described, the combination, with a feed water heater, of a hollow filter rotatably mounted within said heater, a brush rotatably mounted in said heater and adapted to engage the surface of said hollow filter near the top thereof, and a spray pipe mounted within said hollow filter and adapted to discharge against the inner surface thereof at a point beneath the point of contact of said filter with said brush.

4. In a device of the character described, the combination, with a feed water heater, of a hollow filter rotatably mounted within said heater, a brush mounted in said heater and adapted to engage the surface of said hollow filter, and a spray pipe mounted within said hollow filter and adapted to discharge against the inner surface of said hollow filter at a point out of alinement with the point of contact with said brush, substantially as described.

5. In a device of the character described, the combination, with a feed water heater, of a hollow filter rotatably mounted within said heater, a brush mounted within said heater and adapted to engage the surface of said hollow filter, a spray pipe mounted within said hollow filter and adapted to discharge against the inner surface thereof, and a hood extending over said filter and along the sides thereof to a point near the lower surface of the heater.

6. In a device of the character described, the combination, with a feed water heater, and a filter mounted within the same, of a hood extending between the walls of said heater and supported thereby and having side members extending on the opposite sides of said filter to a point near the bottom of the heater, substantially as described.

7. In a device of the character described, the combination, with a feed water heater, a filter rotatably mounted within the same, and a brush rotatably mounted above said filter and adapted to engage the surface thereof, of a hood extending above said brush and supported by the walls of said heater, and extending on opposite sides of said filter to a point near the lower surface of the heater, substantially as described.

8. In a device of the character described, the combination, with a feed water heater, and a filter mounted within the same, of a hood extending between the walls of said heater above said filter and extending along the sides thereof to a point near the lower surface of the heater a door extending longitudinally of said hood near the top thereof, and a manhole formed in the wall of said heater near the door in said hood and extending substantially the full length thereof, substantially as described.

9. In a device of the character described, the combination with a feed water heater having an aperture in one wall thereof, a closure therefor, and bearings supported by the opposite walls of said heater, of a hollow filter of less diameter than the aperture in the wall of said heater and having trunnions adapted to engage said bearings, and an outlet connected with the interior of said hollow filter.

10. In a device of the character described, the combination, with a feed water heater, and a rotary filter mounted within the same, of a hood extending over said filter and along both sides thereof.

In testimony whereof, we affix our signatures in presence of two witnesses.

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CHARLES B. KING.
HARRY J. BARNHART.

Witnesses:
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